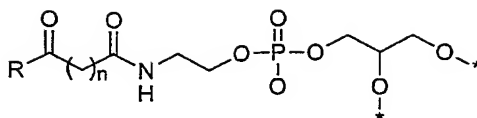


## CLAIMS:

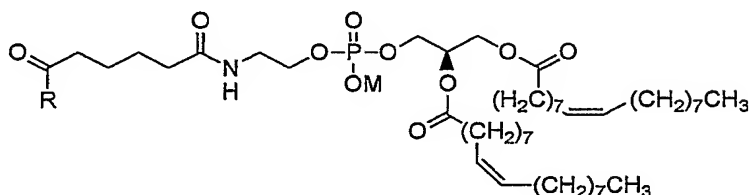
- (1) A molecule of the structure R-S<sub>2</sub>-L for use as a synthetic membrane anchor or in the preparation of synthetic molecule constructs where:
- 5
- R is a chemically reactive functional group;
  - S<sub>2</sub> is a spacer linking R to L; and
  - L is a lipid selected from the group consisting of diacyl- and dialkyl-glycerolipids, including glycerophospholipids, and sphingosine
- 10 derived diacyl- and dialkyl-lipids, including ceramide.
- (2) The molecule of claim 1 where R is selected from the group including: *bis*(N-hydroxysuccinimidyl), *bis*(4-nitrophenyl), *bis*(pentafluorophenyl), *bis*(pentachlorophenyl).
- 15 (3) The molecule of claim 1 or 2 where S<sub>2</sub> is selected from the group including: -CO(CH<sub>2</sub>)<sub>3</sub>CO-, -CO(CH<sub>2</sub>)<sub>4</sub>CO- (adipate (Ad)), and -CO(CH<sub>2</sub>)<sub>5</sub>CO-.
- (4) The molecule of any one of claims 1 to 3 where R and S<sub>2</sub> are ester linked.
- 20 (5) The molecule of any one of claims 1 to 4 where L is a lipid selected from the group consisting of diacyl- and dialkyl-glycerolipids, including glycerophospholipids.
- (6) The molecule according to claim 5 where L is selected from the group consisting of: diacylglycerolipids, phosphatidate, phosphatidyl choline, phosphatidyl ethanolamine, phosphatidyl serine, phosphatidyl inositol, phosphatidyl glycerol, and diphosphatidyl
- 25 glycerol derived from one or more of *trans*-3-hexadecenoic acid, *cis*-5-hexadecenoic acid, *cis*-7-hexadecenoic acid, *cis*-9-hexadecenoic acid, *cis*-6-octadecenoic acid, *cis*-9-octadecenoic acid, *trans*-9-octadecenoic acid, *trans*-11-octadecenoic acid, *cis*-11-octadecenoic acid, *cis*-11-eicosenoic acid or *cis*-13-docsenoic acid.
- 30 (7) The molecule according to claim 6 where the lipid is derived from one or more *cis*-destaured fatty acids.
- (8) The molecule according to claim 7 where L is selected from the group consisting of: 1,2-O-dioleoyl-sn-glycero-3-phosphatidylethanolamine (DOPE), 1,2-O-distearyl-sn-glycero-3-phosphatidylethanolamine (DSPE) and *rac*-1,2-dioleoylglycerol (DOG).
- 35 (9) The molecule according to any one of claims 1 to 8 where L is a glycerophospholipid and the molecule includes the substructure:
- 40



where  $n = 3$  to  $5$  and  $*$  is other than H.

5 (10) The molecule according to claim 9 where  $n$  is 3.

(11) The molecule of claim 1 where the molecule has the structure:

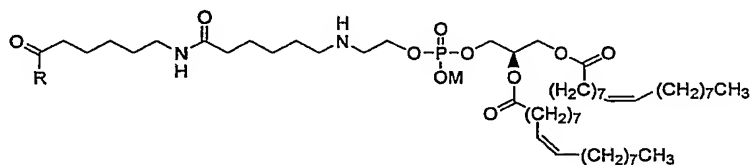


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designated Ad-DOPE and where M is typically H, but may be replaced by another monovalent cation such as  $\text{Na}^+$ ,  $\text{K}^+$  or  $\text{NH}_4^+$ .

(12) The molecule of claim 1 where the molecule has the structure:

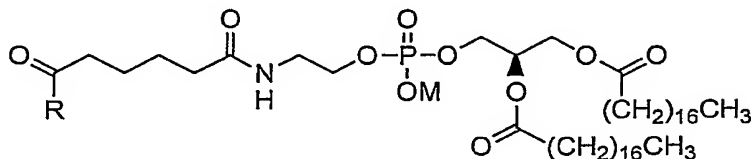
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designated  $\text{sp}_1$ -Ad-DOPE and where M is typically H, but may be replaced by another monovalent cation such as  $\text{Na}^+$ ,  $\text{K}^+$  or  $\text{NH}_4^+$ .

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(13) The molecule of claim 1 where the molecule has the structure:



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designated Ad-DSPE and where M is typically H, but may be replaced by another monovalent cation such as  $\text{Na}^+$ ,  $\text{K}^+$  or  $\text{NH}_4^+$ .

- (14) A **synthetic molecule construct** of the structure F-S<sub>1</sub>-S<sub>2</sub>-L where:
- F is an antigen selected from the group consisting of carbohydrates, proteins, lipids, lectins, avidins and biotin;
  - S<sub>1</sub>-S<sub>2</sub> is a spacer linking F to L; and
  - L is a lipid selected from the group consisting of diacyl- and dialkyl-glycerolipids, including glycerophospholipids, and sphingosine derived diacyl- and dialkyl-lipids, including ceramide.
- (15) The synthetic molecule construct according to claim 14 where the synthetic molecule construct is water soluble.
- (16) The synthetic molecule construct according to claim 14 or 15 where the synthetic molecule construct spontaneously incorporates into a lipid bi-layer when a solution of the synthetic molecule construct is contacted with the lipid bi-layer.
- (17) The synthetic molecule construct according to claim 16 where the synthetic molecule construct stably incorporates into the lipid bilayer.
- (18) The synthetic molecule construct according to any one of claims 14 to 17 where F, S<sub>1</sub>, S<sub>2</sub> and L are covalently linked.
- (19) The synthetic molecule construct according to any one of claims 14 to 18 where F is selected from the group consisting of naturally occurring or synthetic glycotopes, antibodies (immunoglobulins), lectins, avidins, and biotin.
- (20) The synthetic molecule construct according to claim 19 where F is selected from the group consisting of naturally occurring or synthetic glycotopes or antibodies (immunoglobulins).
- (21) The synthetic molecule construct according to any one of claims 14 to 20 where L is a lipid selected from the group consisting of diacyl- and dialkyl-glycerolipids, including glycerophospholipids.
- (22) The synthetic molecule construct according to claim 21 where L is selected from the group consisting of: diacylglycerolipids, phosphatidate, phosphatidyl choline, phosphatidyl ethanolamine, phosphatidyl serine, phosphatidyl inositol, phosphatidyl glycerol, and diphosphatidyl glycerol derived from one or more of *trans*-3-hexadecenoic acid, *cis*-5-hexadecenoic acid, *cis*-7-hexadecenoic acid, *cis*-9-hexadecenoic acid, *cis*-6-octadecenoic acid, *cis*-9-octadecenoic acid, *trans*-9-octadecenoic acid, *trans*-11-octadecenoic acid, *cis*-11-octadecenoic acid, *cis*-11-eicosenoic acid or *cis*-13-docsenoic

acid.

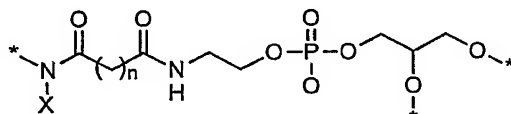
- (23) The synthetic molecule construct according to claim 22 where the lipid is derived from one or more *cis*-destaturated fatty acids.

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- (24) The synthetic molecule construct according to claim 23 where L is selected from the group consisting of: 1,2-O-dioleoyl-sn-glycero-3-phosphatidylethanolamine (DOPE), 1,2-O-distearyl-sn-glycero-3-phosphatidylethanolamine (DSPE) and *rac*-1,2-dioleoylglycerol (DOG).

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- (25) The synthetic molecule construct according to any one of claims 14 to 24 where L is a glycerophospholipid and the synthetic molecule construct includes the substructure:



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where  $n = 3$  to  $5$ ,  $X$  is  $H$  or  $C$ , and  $*$  is other than  $H$ .

- (26) The synthetic molecule construct according to claim 25 where  $n$  is  $3$ .

- 20 (27) The synthetic molecule construct according to any one of claims 14 to 24 where  $S_1$ - $S_2$  is selected to provide a water soluble synthetic molecule construct.

- (28) The synthetic molecule construct according to any one of claims 14 to 27 where  $F$  is a naturally occurring or synthetic glycotope.

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- (29) The synthetic molecule construct according to claim 28 where  $F$  is a naturally occurring or synthetic glycotope consisting of three (trisaccharide) or more sugar units.

- 30 (30) The synthetic molecule construct according to claim 28 where  $F$  is a glycotope selected from the group consisting of lacto-neo-tetraosyl, lactotetraosyl, lacto-nor-hexaosyl, lacto-iso-octaosyl, globotetraosyl, globo-neo-tetraosyl, globopentaosyl, gangliotetraosyl, gangliotriaosyl, gangliopentaosyl, isoglobotriaosyl, isoglobotetraosyl, mucotriaosyl and mucotetraosyl series of oligosaccharides.

- 35 (31) The synthetic molecule construct according to claim 28 where  $F$  is selected from the group of glycotopes comprising the terminal sugars GalNAc $\alpha$ 1-3(Fuc $\alpha$ 1-2)Gal $\beta$ ; Gal $\alpha$ 1-3Gal $\beta$ ; Gal $\beta$ ; Gal $\alpha$ 1-3(Fuc $\alpha$ 1-2)Gal $\beta$ ; NeuAc $\alpha$ 2-3Gal $\beta$ ; NeuAc $\alpha$ 2-6Gal $\beta$ ; Fuc $\alpha$ 1-2Gal $\beta$ ; Gal $\beta$ 1-4GlcNAc $\beta$ 1-6(Gal $\beta$ 1-4GlcNAc $\beta$ 1-3)Gal $\beta$ ; Fuc $\alpha$ 1-2Gal $\beta$ 1-4GlcNAc $\beta$ 1-6(Fuc $\alpha$ 1-2Gal $\beta$ 1-4GlcNAc $\beta$ 1-3)Gal $\beta$ ; Fuc $\alpha$ 1-2Gal $\beta$ 1-4GlcNAc $\beta$ 1-6(NeuAc $\alpha$ 2-3Gal $\beta$ 1-

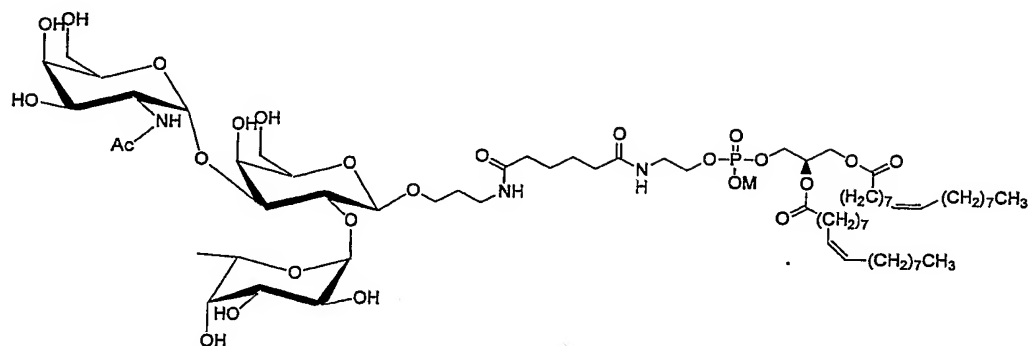
4GlcNAc $\beta$ 1-3)Gal $\beta$ ; NeuAc $\alpha$ 2-3Gal $\beta$ 1-4GlcNAc $\beta$ 1-6(NeuAc $\alpha$ 2-3Gal $\beta$ 1-4GlcNAc $\beta$ 1-3)Gal $\beta$ ; Gal $\alpha$ 1-4Gal $\beta$ 1-4Glc; GalNAc $\beta$ 1-3Gal $\alpha$ 1-4Gal $\beta$ 1-4Glc; GalNAc $\alpha$ 1-3GalNAc $\beta$ 1-3Gal $\alpha$ 1-4Gal $\beta$ 1-4Glc; or GalNAc $\beta$ 1-3GalNAc $\beta$ 1-3Gal $\alpha$ 1-4Gal $\beta$ 1-4Glc.

- 5 (32) The synthetic molecule construct according to any one of claims 14 to 31 where when F is a glycotope, L is a glycerophospholipid and S<sub>2</sub> is selected from the group including: -CO(CH<sub>2</sub>)<sub>3</sub>CO-, -CO(CH<sub>2</sub>)<sub>4</sub>CO- (adipate), -CO(CH<sub>2</sub>)<sub>5</sub>CO-, and -CO(CH<sub>2</sub>)<sub>5</sub>NHCO(CH<sub>2</sub>)<sub>5</sub>CO-.
- 10 (33) The synthetic molecule construct according to any one of claims 14 to 32 where S<sub>1</sub> is a C<sub>3-5</sub>-aminoalkyl selected from the group consisting of: 3-aminopropyl, 4-aminobutyl, or 5-aminopentyl).
- (34) The synthetic molecule construct according to claim 33 where S<sub>1</sub> is 3-aminopropyl.
- 15 (35) The synthetic molecule construct according to any one of claims 14 to 27 where F mediates a cell-cell or cell-surface interaction.
- (36) The synthetic molecule construct according to claim 35 where F is carbohydrate, protein, lipid, lectin, avidin or biotin with an affinity for a component expressed on a
- 20 targeted cell or surface.
- (37) The synthetic molecule construct according to claim 36 where F has an affinity for a component expressed on epithelial cells or extra-cellular matrices.
- 25 (38) The synthetic molecule construct according to claim 37 where F has an affinity for a component expressed on the epithelial cells or the extra-cellular matrix of the endometrium.
- 30 (39) The synthetic molecule construct according to claim 38 where the component expressed on the epithelial cells or the extra-cellular matrix of the endometrium can be a naturally expressed component or an exogenously incorporated component.
- 35 (40) The synthetic molecule construct according to any one of claims 14 to 27 where F mediates a cell-solute interaction.
- (41) The synthetic molecule construct according to claim 40 where F is a ligand for a binding molecule where the presence of the binding molecule is diagnostic for a pathological condition.
- 40 (42) The synthetic molecule construct according to claim 41 where F is a ligand for an

antibody (immunoglobulin).

- (43) The synthetic molecule construct according to claim 14 where the water soluble synthetic molecule construct has the structure:

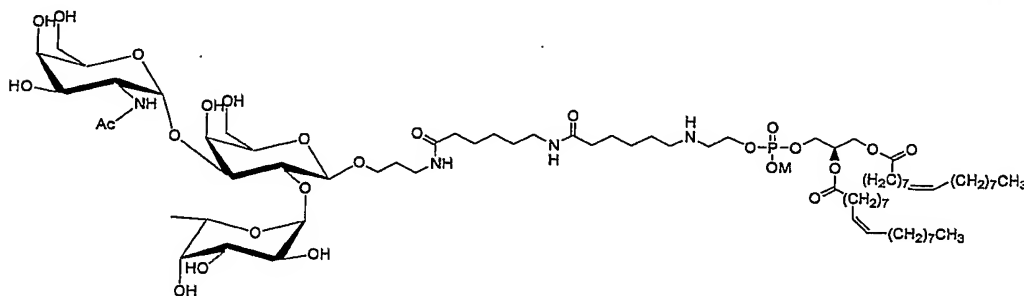
5



designated  $A_{\text{tri}}\text{-sp-Ad-DOPE (I)}$  and M is typically H, but may be replaced by another monovalent cation such as  $\text{Na}^+$ ,  $\text{K}^+$  or  $\text{NH}_4^+$ .

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- (44) The synthetic molecule construct according to claim 14 where the water soluble synthetic molecule construct has the structure:

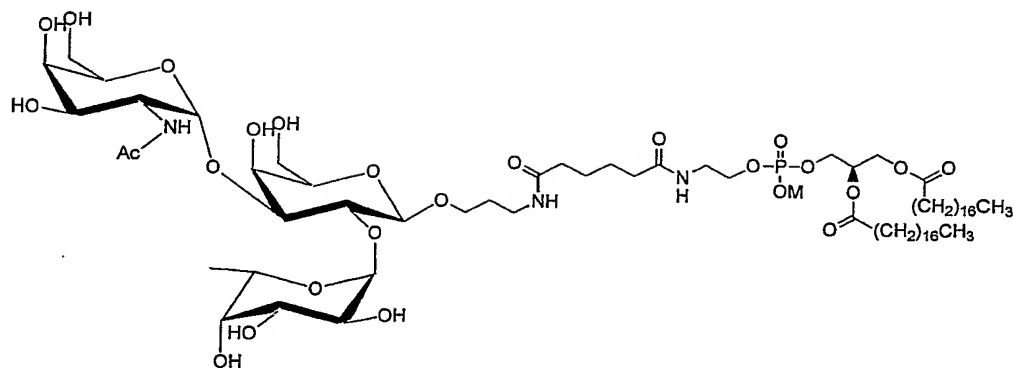


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designated  $A_{\text{tri}}\text{-spsp}_1\text{-Ad-DOPE (II)}$  and M is typically H, but may be replaced by another monovalent cation such as  $\text{Na}^+$ ,  $\text{K}^+$  or  $\text{NH}_4^+$ .

- (45) The synthetic molecule construct according to claim 14 where the water soluble synthetic molecule construct has the structure:

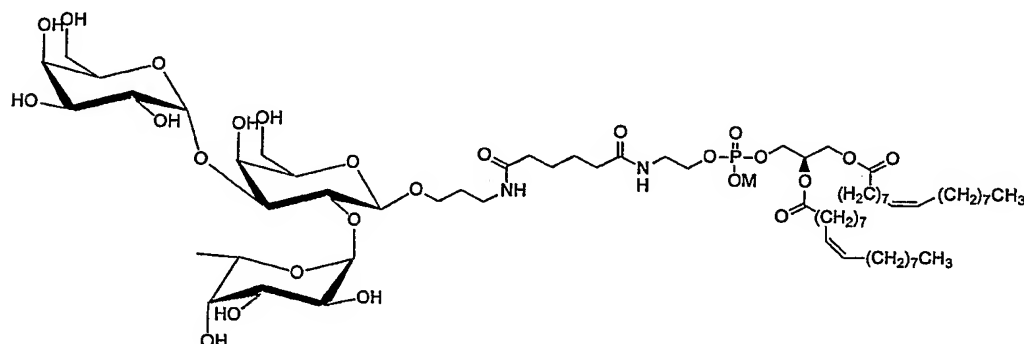
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designated A<sub>tr</sub>-sp-Ad-DSPE (III) and M is typically H, but may be replaced by another monovalent cation such as Na<sup>+</sup>, K<sup>+</sup> or NH<sub>4</sub><sup>+</sup>.

5

- (46) The synthetic molecule construct according to claim 14 where the water soluble synthetic molecule construct has the structure:

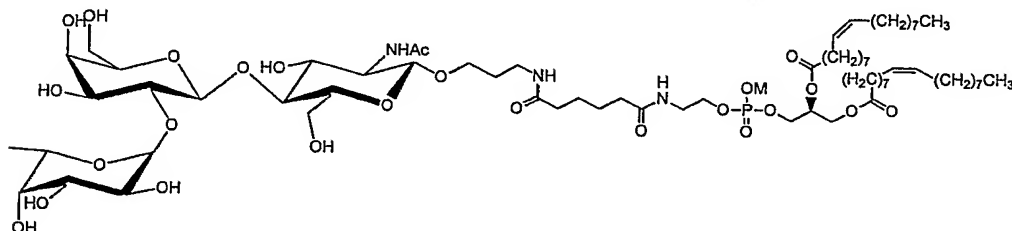


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designated B<sub>tr</sub>-sp-Ad-DOPE (VI) and M is typically H, but may be replaced by another monovalent cation such as Na<sup>+</sup>, K<sup>+</sup> or NH<sub>4</sub><sup>+</sup>.

- (47) The synthetic molecule construct according to claim 14 where the water soluble synthetic molecule construct has the structure:

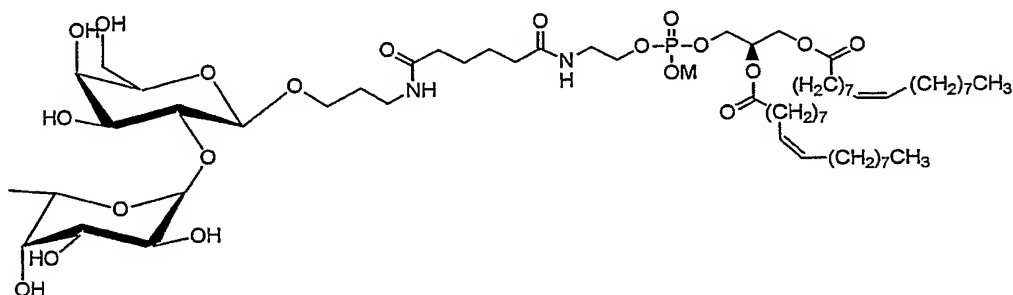
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designated H<sub>tr</sub>-sp-Ad-DOPE (VII) and M is typically H, but may be replaced by another monovalent cation such as Na<sup>+</sup>, K<sup>+</sup> or NH<sub>4</sub><sup>+</sup>.

20

- (48) The synthetic molecule construct according to claim 14 where the water soluble synthetic molecule construct has the structure:

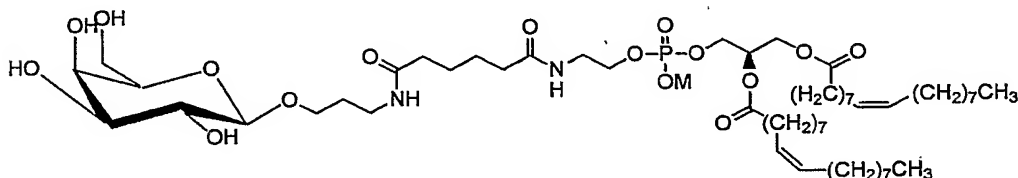


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designated H<sub>4</sub>I-sp-Ad-DOPE (VIII) and M is typically H, but may be replaced by another monovalent cation such as Na<sup>+</sup>, K<sup>+</sup> or NH<sub>4</sub><sup>+</sup>.

- (49) The synthetic molecule construct according to claim 14 where the water soluble synthetic molecule construct has the structure:

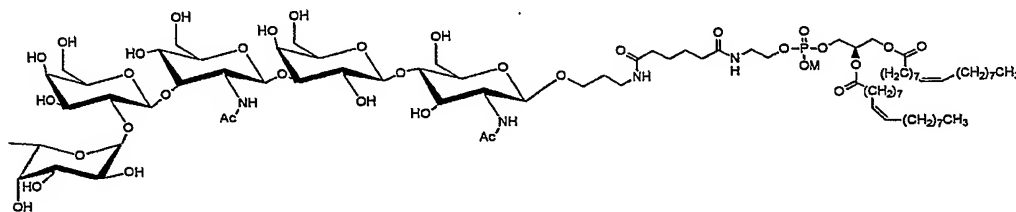
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designated Gal<sub>3</sub>I-sp-Ad-DOPE (IX) and M is typically H, but may be replaced by another monovalent cation such as Na<sup>+</sup>, K<sup>+</sup> or NH<sub>4</sub><sup>+</sup>.

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- (50) The synthetic molecule construct according to claim 14 where the water soluble synthetic molecule construct has the structure:



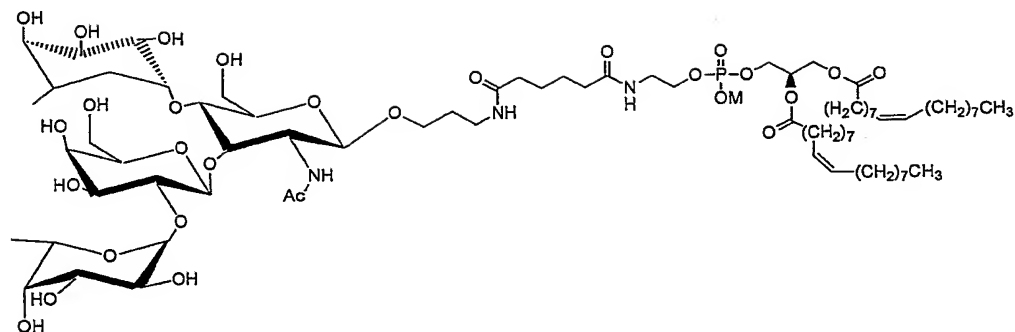
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designated Fuα<sub>1</sub>-2Galβ<sub>1</sub>-3GlcNAcβ<sub>1</sub>-3Galβ<sub>1</sub>-4GlcNAc-sp-Ad-DOPE (XII) and M is typically H, but may be replaced by another monovalent cation such as Na<sup>+</sup>, K<sup>+</sup> or NH<sub>4</sub><sup>+</sup>.

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- (51) The synthetic molecule construct according to claim 14 where the water soluble synthetic molecule construct has the structure:





designated Fuc $\alpha$ 1-2Gal $\beta$ 1-3(Fuc $\alpha$ 1-4)GlcNAc-sp-Ad-DOPE (XIII) and M is typically H, but may be replaced by another monovalent cation such as Na<sup>+</sup>, K<sup>+</sup> or NH<sub>4</sub><sup>+</sup>.

5

(52) A method of preparing a synthetic molecule construct of the structure F-S<sub>1</sub>-S<sub>2</sub>-L including the steps:

- Reacting an activator (A) with a lipid (L) to provide an activated lipid (A-L);
- Derivatising an antigen (F) to provide a derivatised antigen (F-S<sub>1</sub>); and
- Condensing A-L with F-S<sub>1</sub> to provide the construct;

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where:

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A is an activator selected from the group including: *bis*(N-hydroxysuccinimidyl), *bis*(4-nitrophenyl), *bis*(pentafluorophenyl), *bis*(pentachlorophenyl) esters of carbodioic acids (C<sub>3</sub> to C<sub>7</sub>);

20

L is a lipid selected from the group consisting of diacyl- and dialkyl-glycerolipids, including glycerophospholipids, and sphingosine derived diacyl- and dialkyl-lipids, including ceramide.

F is an antigen selected from the group consisting of carbohydrates, proteins, lipids, lectins, avidins or biotin; and

25

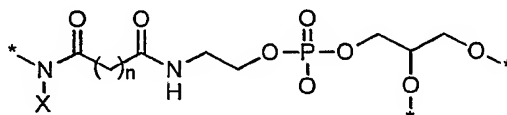
S<sub>1</sub>-S<sub>2</sub> is a spacer linking F to L where S<sub>1</sub> is selected from the group including: primary aminoalkyl, secondary aliphatic aminoalkyl or primary aromatic amine; and S<sub>2</sub> is absent or selected from the group including: -CO(CH<sub>2</sub>)<sub>3</sub>CO-, -CO(CH<sub>2</sub>)<sub>4</sub>CO- (adipate), and -CO(CH<sub>2</sub>)<sub>5</sub>CO-.

(53) The method according to claim 52 where the synthetic molecule construct is water soluble.

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(54) The method according to claim 51 or 52 where the synthetic molecule construct spontaneously incorporates into a lipid bi-layer when a solution of the synthetic molecule construct is contacted with the lipid bi-layer.

- (55) The method according to claim 54 where the synthetic molecule construct stably incorporates into the lipid bilayer.
- 5 (56) The method according to any one of claims 52 to 55 where F, S<sub>1</sub>, S<sub>2</sub> and L are covalently linked.
- (57) The method according to any one of claims 52 to 56 where F is selected from the group consisting of naturally occurring or synthetic glycotopes, antibodies (immunoglobulins), lectins, avidins, and biotin.
- 10 (58) The method according to claim 57 where F is selected from the group consisting of naturally occurring or synthetic glycotopes or antibodies (immunoglobulins).
- (59) The method according to any one of claims 52 to 58 where L is a lipid selected from the group consisting of diacyl- and dialkyl-glycerolipids, including glycerophospholipids.
- 15 (60) The method according to claim 59 where L is selected from the group consisting of: diacylglycerolipids, phosphatidate, phosphatidyl choline, phosphatidyl ethanolamine, phosphatidyl serine, phosphatidyl inositol, phosphatidyl glycerol, and diphosphatidyl glycerol derived from one or more of *trans*-3-hexadecenoic acid, *cis*-5-hexadecenoic acid, *cis*-7-hexadecenoic acid, *cis*-9-hexadecenoic acid, *cis*-6-octadecenoic acid, *cis*-9-octadecenoic acid, *trans*-9-octadecenoic acid, *trans*-11-octadecenoic acid, *cis*-11-octadecenoic acid, *cis*-11-eicosenoic acid or *cis*-13-docsenoic acid.
- 20 (61) The method according to claim 60 where the lipid is derived from one or more *cis*-destaured fatty acids.
- (62) The method according to claim 61 where L is selected from the group consisting of: 1,2-O-dioleoyl-sn-glycero-3-phosphatidylethanolamine (DOPE), 1,2-O-distearyl-sn-glycero-3-phosphatidylethanolamine (DSPE) and *rac*-1,2-dioleoylglycerol (DOG).
- 30 (63) The method according to any one of claims 52 to 62 where L is a glycerophospholipid and the synthetic molecule construct includes the substructure:



where  $n = 3$  to  $5$ ,  $X$  is  $H$  or  $C$ , and  $*$  is other than  $H$ .

- (64) The method according to claim 63 where  $n$  is  $3$ .

- (65) The method according to any one of claims 52 to 62 where A and S<sub>1</sub> are selected to provide a water soluble synthetic molecule construct.
- 5 (66) The method according to any one of claims 52 to 65 where F is a naturally occurring or synthetic glycotope.
- (67) The method according to claim 66 where F is a naturally occurring or synthetic glycotope consisting of three (trisaccharide) or more sugar units.
- 10 (68) The method according to claim 66 where F is a glycotope selected from the group consisting of lacto-neo-tetraosyl, lactotetraosyl, lacto-nor-hexaosyl, lacto-iso-octaosyl, globoteraosyl, globo-neo-tetraosyl, globopentaosyl, gangliotetraosyl, gangliotriaosyl, gangliopentaosyl, isoglobotriaosyl, isoglobotetraosyl, mucotriaosyl and mucotetraosyl series of oligosaccharides.
- 15 (69) The method according to claim 66 where F is selected from the group of glycotopes comprising the terminal sugars GalNAc $\alpha$ 1-3(Fuc $\alpha$ 1-2)Gal $\beta$ ; Gal $\alpha$ 1-3Gal $\beta$ ; Gal $\beta$ ; Gal $\alpha$ 1-3(Fuc $\alpha$ 1-2)Gal $\beta$ ; NeuAc $\alpha$ 2-3Gal $\beta$ ; NeuAc $\alpha$ 2-6Gal $\beta$ ; Fuc $\alpha$ 1-2Gal $\beta$ ; Gal $\beta$ 1-4GlcNAc $\beta$ 1-6(Gal $\beta$ 1-4GlcNAc $\beta$ 1-3)Gal $\beta$ ; Fuc $\alpha$ 1-2Gal $\beta$ 1-4GlcNAc $\beta$ 1-6(Fuc $\alpha$ 1-2Gal $\beta$ 1-4GlcNAc $\beta$ 1-3)Gal $\beta$ ; Fuc $\alpha$ 1-2Gal $\beta$ 1-4GlcNAc $\beta$ 1-6(NeuAc $\alpha$ 2-3Gal $\beta$ 1-4GlcNAc $\beta$ 1-3)Gal $\beta$ ; NeuAc $\alpha$ 2-3Gal $\beta$ 1-4GlcNAc $\beta$ 1-6(NeuAc $\alpha$ 2-3Gal $\beta$ 1-4GlcNAc $\beta$ 1-3)Gal $\beta$ ; Gal $\alpha$ 1-4Gal $\beta$ 1-4Glc; GalNAc $\beta$ 1-3Gal $\alpha$ 1-4Gal $\beta$ 1-4Glc; GalNAc $\alpha$ 1-3GalNAc $\beta$ 1-3Gal $\alpha$ 1-4Gal $\beta$ 1-4Glc; or GalNAc $\beta$ 1-3GalNAc $\beta$ 1-3Gal $\alpha$ 1-4Gal $\beta$ 1-4Glc.
- 20 (70) The method according to any one of claims 52 to 69 where when F is a glycotope, L is a glycerophospholipid and S<sub>2</sub> is selected from the group including: -CO(CH<sub>2</sub>)<sub>3</sub>CO-, -CO(CH<sub>2</sub>)<sub>4</sub>CO- (adipate), -CO(CH<sub>2</sub>)<sub>5</sub>CO- and -CO(CH<sub>2</sub>)<sub>5</sub>NHCO(CH<sub>2</sub>)<sub>5</sub>CO-.
- 25 (71) The method according to any one of claims 52 to 70 where S<sub>1</sub> is a C<sub>3-5</sub>-aminoalkyl selected from the group consisting of: 3-aminopropyl, 4-aminobutyl, or 5-aminopentyl.
- (72) The method according to claim 71 where S<sub>1</sub> is 3-aminopropyl.
- 35 (73) The method according to any one of claims 52 to 65 where F is a synthetic molecule construct that mediates a cell-cell or cell-surface interaction.
- (74) The method according to claim 73 where F is carbohydrate, protein or lipid with an affinity for a component expressed on a targeted cell or surface.
- 40 (75) The method according to claim 74 where F has an affinity for a component expressed

on epithelial cells or extra-cellular matrices.

(76) The method according to claim 75 where F has an affinity for a component expressed on the epithelial cells or the extra-cellular matrix of the endometrium.

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(77) The method according to claim 76 where the component expressed on the epithelial cells or the extra-cellular matrix of the endometrium can be a naturally expressed component or an exogenously incorporated component.

10 (78) The method according to any one of claims 52 to 65 where F is a synthetic molecule construct that mediates a cell-solute interaction.

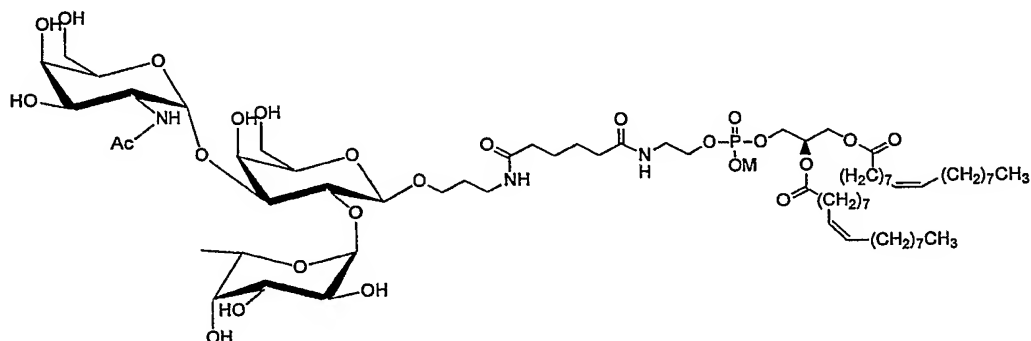
(79) The method according to claim 78 where F is a ligand for a binding molecule where the presence of the binding molecule is diagnostic for a pathological condition.

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(80) The method according to claim 79 where F is a ligand for an antibody (immunoglobulin).

(81) The method according to claim 52 where the water soluble synthetic molecule construct has the structure:

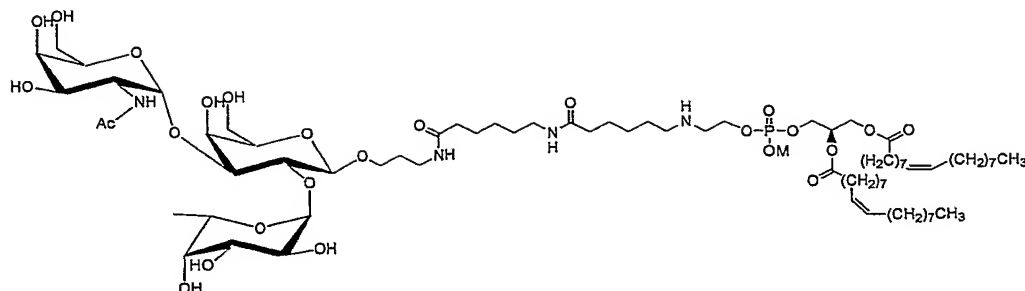
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designated A<sub>tri</sub>-sp-Ad-DOPE (I) and where M is typically H, but may be replaced by another monovalent cation such as Na<sup>+</sup>, K<sup>+</sup> or NH<sub>4</sub><sup>+</sup>.

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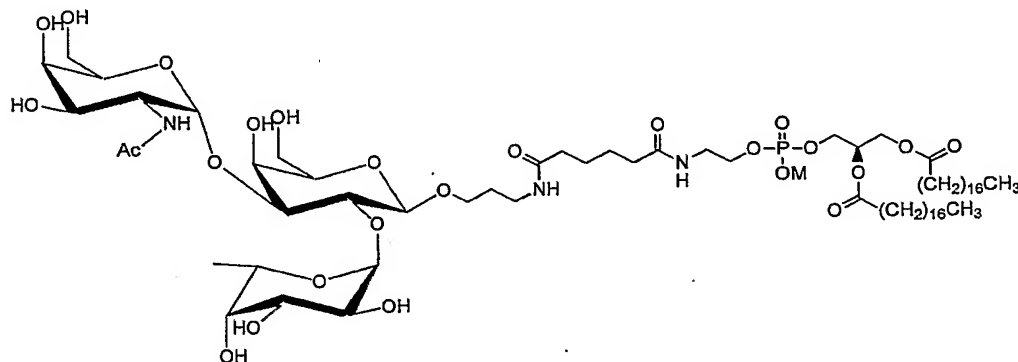
(82) The method according to claim 52 where the water soluble synthetic molecule construct has the structure:



designated A<sub>tri</sub>-spsp<sub>1</sub>-Ad-DOPE (II) and where M is typically H, but may be replaced by another monovalent cation such as Na<sup>+</sup>, K<sup>+</sup> or NH<sub>4</sub><sup>+</sup>.

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- (83) The method according to claim 52 where the water soluble synthetic molecule construct has the structure:

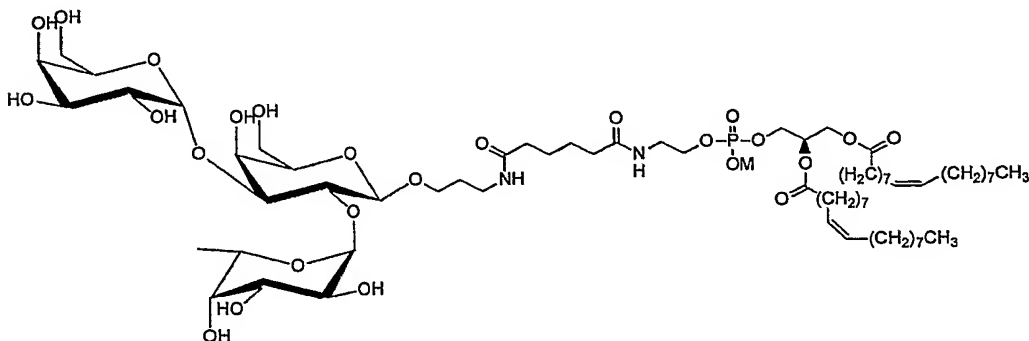


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designated A<sub>tri</sub>-sp-Ad-DSPE (III) and where M is typically H, but may be replaced by another monovalent cation such as Na<sup>+</sup>, K<sup>+</sup> or NH<sub>4</sub><sup>+</sup>.

- (84) The method according to claim 52 where the water soluble synthetic molecule construct has the structure:

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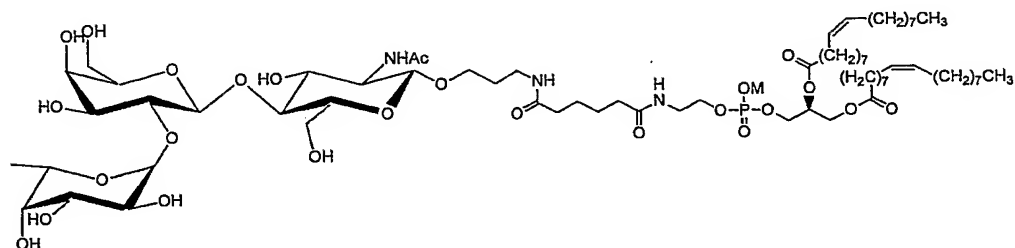


designated B<sub>tri</sub>-sp-Ad-DOPE (VI) and where M is typically H, but may be replaced by

another monovalent cation such as  $\text{Na}^+$ ,  $\text{K}^+$  or  $\text{NH}_4^+$ .

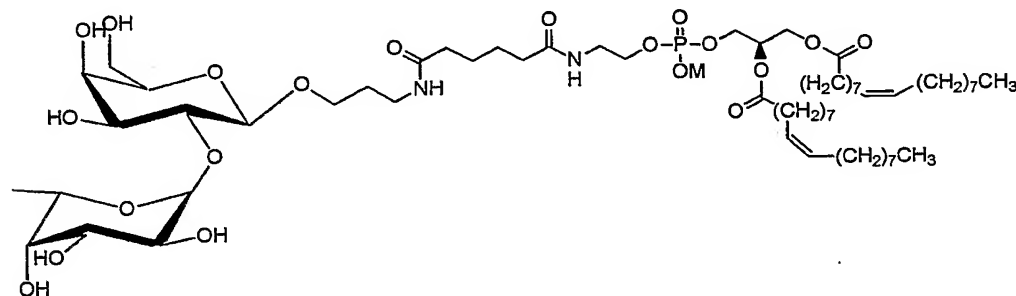
- (85) The method according to claim 52 where the water soluble synthetic molecule construct has the structure:

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designated  $\text{H}_{\text{tri}}\text{-sp-Ad-DOPE}$  (VII) and where M is typically H, but may be replaced by another monovalent cation such as  $\text{Na}^+$ ,  $\text{K}^+$  or  $\text{NH}_4^+$ .

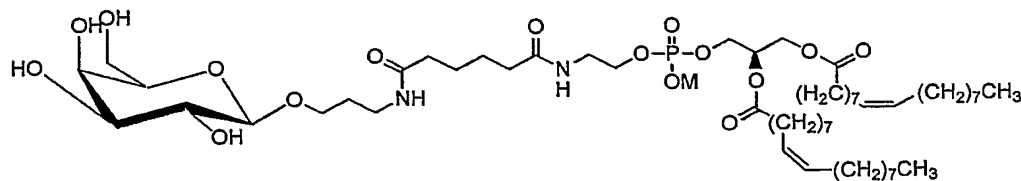
- 10 (86) The method according to claim 52 where the water soluble synthetic molecule construct has the structure:



- 15 designated  $\text{H}_{\text{di}}\text{-sp-Ad-DOPE}$  (VIII) and where M is typically H, but may be replaced by another monovalent cation such as  $\text{Na}^+$ ,  $\text{K}^+$  or  $\text{NH}_4^+$ .

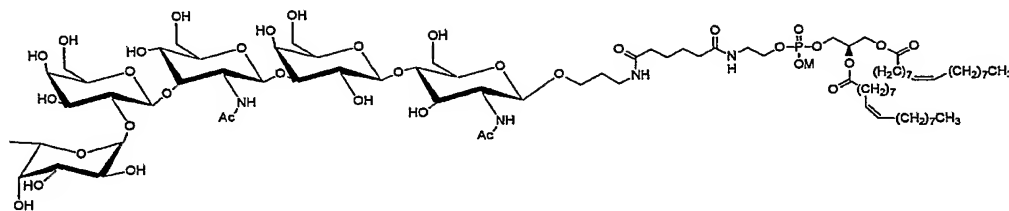
- (87) The method according to claim 52 where the water soluble synthetic molecule construct has the structure:

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designated  $\text{Gal}\beta_1\text{-sp-Ad-DOPE}$  (IX);

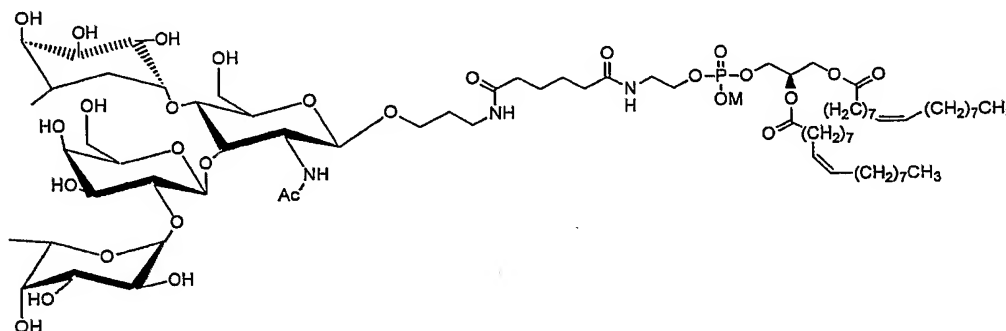
- (88) The method according to claim 52 where the water soluble synthetic molecule construct has the structure:



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designated Fuc $\alpha$ 1-2Gal $\beta$ 1-3GlcNAc $\beta$ 1-3Gal $\beta$ 1-4GlcNAc-sp-Ad-DOPE (XII) and where M is typically H, but may be replaced by another monovalent cation such as Na<sup>+</sup>, K<sup>+</sup> or NH<sub>4</sub><sup>+</sup>.

- 10 (89) The method according to claim 52 where the water soluble synthetic molecule construct has the structure:



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designated Fuc $\alpha$ 1-2Gal $\beta$ 1-3(Fuc $\alpha$ 1-4)GlcNAc-sp-Ad-DOPE (XIII) and where M is typically H, but may be replaced by another monovalent cation such as Na<sup>+</sup>, K<sup>+</sup> or NH<sub>4</sub><sup>+</sup>.

- (90) A water soluble **synthetic molecule construct** prepared by a method according to any one of claims 52 to 89

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- (91) A **method** of effecting qualitative and/or quantitative changes in the surface antigens expressed by a cell or multi-cellular structure including the step:

- Contacting a suspension of the cell or multi-cellular structure with a water soluble synthetic molecule construct according to any one of claims 14 to 51 or 90 for a time and at a temperature sufficient to effect the qualitative and/or quantitative change in the surface antigens expressed by the cell or multi-cellular structure.

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- 30 (92) The method according to claim 91 where the cell or multi-cellular structure is of human

or murine origin.

- (93) The method according to claim 91 or 92 where the concentration of the water soluble synthetic molecule construct in the suspension is in the range 0.1 to 10 mg/mL.
- 5 (94) The method according to any one of claims 91 to 93 where the suspension of the cell or multi-cellular structure is contacted with the water soluble synthetic molecule construct at a temperature in the range 2 to 37 °C.
- 10 (95) The method according claim 94 where the suspension of the cell or multi-cellular structure is contacted with the solution of the water soluble synthetic molecule construct at a temperature in the range 2 to 25 °C.
- 15 (96) The method according claim 95 where the suspension of the cell or multi-cellular structure is contacted with the solution of the water soluble synthetic molecule construct at a temperature in the range 2 to 4 °C.
- (97) The method according to any one of claims 91 to 96 where F is selected from the group of glycotopes comprising the terminal sugars GalNAc $\alpha$ 1-3(Fuc $\alpha$ 1-2)Gal $\beta$ ; Gal $\alpha$ 1-3Gal $\beta$ ; Gal $\beta$ ; Gal $\alpha$ 1-3(Fuc $\alpha$ 1-2)Gal $\beta$ ; NeuAc $\alpha$ 2-3Gal $\beta$ ; NeuAc $\alpha$ 2-6Gal $\beta$ ; Fuc $\alpha$ 1-2Gal $\beta$ ; Gal $\beta$ 1-4GlcNAc $\beta$ 1-6(Gal $\beta$ 1-4GlcNAc $\beta$ 1-3)Gal $\beta$ ; Fuc $\alpha$ 1-2Gal $\beta$ 1-4GlcNAc $\beta$ 1-6(Fuc $\alpha$ 1-2Gal $\beta$ 1-4GlcNAc $\beta$ 1-3)Gal $\beta$ ; Fuc $\alpha$ 1-2Gal $\beta$ 1-4GlcNAc $\beta$ 1-6(NeuAc $\alpha$ 2-3Gal $\beta$ 1-4GlcNAc $\beta$ 1-3)Gal $\beta$ ; NeuAc $\alpha$ 2-3Gal $\beta$ 1-4GlcNAc $\beta$ 1-6(NeuAc $\alpha$ 2-3Gal $\beta$ 1-4GlcNAc $\beta$ 1-3)Gal $\beta$ ; Gal $\alpha$ 1-4Gal $\beta$ 1-4Glc; GalNAc $\beta$ 1-3Gal $\alpha$ 1-4Gal $\beta$ 1-4Glc; GalNAc $\alpha$ 1-3GalNAc $\beta$ 1-3Gal $\alpha$ 1-4Gal $\beta$ 1-4Glc; or GalNAc $\beta$ 1-3GalNAc $\beta$ 1-3Gal $\alpha$ 1-4Gal $\beta$ 1-4Glc.
- 20 (98) The method according to claim 97 where F is selected from the group of glycotopes consisting of the oligosaccharides GalNAc $\alpha$ 1-3(Fuc $\alpha$ 1-2)Gal $\beta$  and Gal $\alpha$ 1-3(Fuc $\alpha$ 1-2)Gal $\beta$ .
- 30 (99) The method according to any one of claim 91 or 96 where the synthetic molecule construct is selected from the group including: A<sub>tri</sub>-sp-Ad-DOPE (I); A<sub>tri</sub>-sp-sp<sub>1</sub>-Ad-DOPE (II); A<sub>tri</sub>-sp-Ad-DSPE (III); B<sub>tri</sub>-sp-Ad-DOPE (VI); H<sub>tri</sub>-sp-Ad-DOPE (VII); H<sub>di</sub>-sp-Ad-DOPE (VIII); Gal $\beta$ <sub>1</sub>-sp-Ad-DOPE (IX); Fuc $\alpha$ 1-2Gal $\beta$ 1-3GlcNAc $\beta$ 1-3Gal $\beta$ 1-4GlcNAc-sp-Ad-DOPE (XII); and Fuc $\alpha$ 1-2Gal $\beta$ 1-3(Fuc $\alpha$ 1-4)GlcNAc-sp-Ad-DOPE (XIII).
- 35 (100) The method according to any one of claims 91 to 99 where the cell or multi-cellular structure is an embryo.
- 40 (101) The method according to claim 100 where F is an attachment molecule where the attachment molecule has an affinity for a component expressed on the epithelial cells or



the extra-cellular matrix of the endometrium.

- 5 (102) The method according to claim 101 where the component expressed on the epithelial cells or the extra-cellular matrix of the endometrium can be a naturally expressed component or an exogenously incorporated component.
- (103) The method according to any one of claims 91 to 99 where the cell or multi-cellular structure is a red blood cell.
- 10 (104) The method according to claim 103 where F is a ligand for a binding molecule where the presence of the binding molecule is diagnostic for a pathological condition.
- (105) The method according to claim 104 where F is a ligand for an antibody (immunoglobulin).
- 15 (106) A **cell or multi-cellular structure** incorporating a water soluble synthetic molecule construct according to any one of claims 14 to 51 or 90.
- (107) The cell or multi-cell structure according to claim 106 where the cell or multi-cellular structure is of human or murine origin.
- 20 (108) The cell or multi-cell structure according to claim 106 or 107 where the cell or multi-cell structure is a red blood cell incorporating a water soluble synthetic molecule construct selected from the group including: A<sub>tri</sub>-sp-Ad-DOPE (I); A<sub>tri</sub>-spsp<sub>1</sub>-Ad-DOPE (II); A<sub>tri</sub>-sp-Ad-DSPE (III); B<sub>tri</sub>-sp-Ad-DOPE (VI); H<sub>tri</sub>-sp-Ad-DOPE (VII); H<sub>di</sub>-sp-Ad-DOPE (VIII); Galβ<sub>1</sub>-sp-Ad-DOPE (IX); Fuca<sub>1</sub>-2Galβ<sub>1</sub>-3GlcNAcβ<sub>1</sub>-3Galβ<sub>1</sub>-4GlcNAc-sp-Ad-DOPE (XII); and Fuca<sub>1</sub>-2Galβ<sub>1</sub>-3(Fuca<sub>1</sub>-4)GlcNAc-sp-Ad-DOPE (XIII).
- 25 (109) The cell or multi-cell structure according to claim 106 or 107 where the cell or multi-cell structure is an embryo incorporating a water soluble synthetic molecule construct selected from the group consisting of: A<sub>tri</sub>-sp-Ad-DOPE (I); A<sub>tri</sub>-spsp<sub>1</sub>-Ad-DOPE (II); A<sub>tri</sub>-sp-Ad-DSPE (III); B<sub>tri</sub>-sp-Ad-DOPE (VI); H<sub>tri</sub>-sp-Ad-DOPE (VII); H<sub>di</sub>-sp-Ad-DOPE (VIII); Galβ<sub>1</sub>-sp-Ad-DOPE (IX); Fuca<sub>1</sub>-2Galβ<sub>1</sub>-3GlcNAcβ<sub>1</sub>-3Galβ<sub>1</sub>-4GlcNAc-sp-Ad-DOPE (XII); and Fuca<sub>1</sub>-2Galβ<sub>1</sub>-3(Fuca<sub>1</sub>-4)GlcNAc-sp-Ad-DOPE (XIII).
- 30 (110) A **kit** comprising a preparation of a molecule according to any one of claims 1 to 13, or a dried preparation or solution of a water soluble synthetic molecule construct according to any one of claims 14 to 51 or 90.
- 35 (111) The kit according to claim 110 where the molecule according to any one of claims 1 to 13 is selected from the group consisting of: Ad-DOPE; sp<sub>1</sub>-Ad-DOPE; and Ad-DSPE.
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- (112) The kit according to claim 1 where water soluble synthetic molecule construct according to any one of claims 14 to 51 or 90 is selected from the group consisting of: A<sub>tri</sub>-sp-Ad-DOPE (I); A<sub>tri</sub>-sp-sp<sub>1</sub>-Ad-DOPE (II); A<sub>tri</sub>-sp-Ad-DSPE (III); B<sub>tri</sub>-sp-Ad-DOPE (VI); H<sub>tri</sub>-sp-Ad-DOPE (VII); H<sub>di</sub>-sp-Ad-DOPE (VIII); Gal $\beta$ <sub>1</sub>-sp-Ad-DOPE (IX); Fuca<sub>1</sub>-2Gal $\beta$ <sub>1</sub>-3GlcNAc $\beta$ <sub>1</sub>-3Gal $\beta$ <sub>1</sub>-4GlcNAc-sp-Ad-DOPE (XII); and Fuca<sub>1</sub>-2Gal $\beta$ <sub>1</sub>-3(Fuca<sub>1</sub>-4)GlcNAc-sp-Ad-DOPE (XIII).
- (113) A kit comprising a suspension in a suspending solution of cells or multi-cellular structures according to any one of claims 106 to 109.
- (114) The kit according to claim 113 where the suspending solution is substantially free of lipid.
- (115) The kit according to claim 113 or 114 where the cell or multi-cellular structure is of human or murine origin.
- (116) The kit according to any one of claims 113 to 115 where the cells are red blood cells that do not naturally express A- or B-antigen and incorporate a water soluble synthetic molecule construct selected from the group consisting of: A<sub>tri</sub>-sp-Ad-DOPE (I); A<sub>tri</sub>-sp-sp<sub>1</sub>-Ad-DOPE (II); A<sub>tri</sub>-sp-Ad-DSPE (III); B<sub>tri</sub>-sp-Ad-DOPE (VI); H<sub>tri</sub>-sp-Ad-DOPE (VII); H<sub>di</sub>-sp-Ad-DOPE (VIII); Gal $\beta$ <sub>1</sub>-sp-Ad-DOPE (IX); Fuca<sub>1</sub>-2Gal $\beta$ <sub>1</sub>-3GlcNAc $\beta$ <sub>1</sub>-3Gal $\beta$ <sub>1</sub>-4GlcNAc-sp-Ad-DOPE (XII); and Fuca<sub>1</sub>-2Gal $\beta$ <sub>1</sub>-3(Fuca<sub>1</sub>-4)GlcNAc-sp-Ad-DOPE (XIII).
- (117) The kit according to claim 116 where the suspending solution additionally contains one or more antibodies.
- (118) The kit according to claim 117 where the cells are sensitivity controls.
- (119) A **pharmaceutical preparation** comprising a dried preparation or solution of a water soluble synthetic molecule construct according to any one of claims 14 to 51 or 90.
- (120) The pharmaceutical preparation according to claim 119 where the pharmaceutical preparation is in a form for administration by inhalation.
- (121) The pharmaceutical preparation according to claim 120 where the pharmaceutical preparation is in a form for administration by injection.
- (122) A **pharmaceutical preparation** comprising cells or multi-cellular structures according to any one of claims 106 to 109.

- (123) The pharmaceutical preparation according to claim 122 where the cells or multi-cellular structures are of human or murine origin.
- 5 (124) The pharmaceutical preparation according to claim 122 or 123 where the pharmaceutical preparation is in a form for administration by inhalation.
- (125) The pharmaceutical preparation according to claim 122 or 123 where the pharmaceutical preparation is in a form for administration by injection.